

REMARKS

This is in response to the Office Action dated January 11 2010. In view of the foregoing amendments and following representations, reconsideration is respectfully requested.

By the above amendments, claims 1 and 4 are amended; and claims 2-3 are cancelled. Thus, claims 1 and 4-7 are currently pending in the present application.

1. Amendment to the Specification and Abstract

The specification has been amended to conform the originally-filed specification to a preferred U.S. format. Also, the abstract has been amended to make minor clarifying and other editorial amendments. Note that the changes to the abstract are submitted in the form of a substitute abstract. A copy of the originally-filed abstract, with changes marked therein, is attached and entitled "Version with Markings to Show Changes Made."

2. Rejection under 35 U.S.C. § 103(a)

On pages 2-4 of the Office Action, claims 1 and 3-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liechty (U.S. Patent No. 5,435,056). Also, claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liechty in view of Davis (U.S. Patent No. 3,707,027). It is submitted that the present invention, as embodied by the amended claims, now clearly distinguishes over the Liechty and Davis references for the following reasons.

The Present Invention

An object of the present invention is to provide a piston ring installing device capable of improving the positioning accuracy of a piston, improving productivity, and reducing costs while increasing processing speed with a simple mechanical structure without employing a complex control sequence and the like.

Independent claim 1, as amended, is directed to a device for installing a piston ring and requires, *inter alia*:

a base that has a through-hole passing through the base in a vertical direction;
a guide member disposed in the through-hole and fixed to the base, the guide member having a concave part for receiving a head of a piston that is suspended and held downwardly in a vertical direction and swingably connected to a connecting rod, and guiding a piston ring while

widening a diameter of the piston ring by means of an outer peripheral surface of the guide member;

a piston pressing member disposed above the base and having a centering part that performs a centering action while coming into contact with an upper end edge of the piston suspended downwardly in the vertical direction;

a driving mechanism, provided on the base, for driving the piston pressing member toward the concave part of the guide member while holding the piston pressing member; and

a ring feeding mechanism that feeds the piston ring guided by the guide member upwardly,

wherein the centering part of the piston pressing member is formed into a cylindrical cap that is opened downwardly and has a notch part defined by cutting off a part thereof so as not to come into contact with the connecting rod of the piston, and a tapered inner wall surface that is widened downwardly so as to come into contact with the upper end edge of the piston.

To facilitate the discussion of the claimed invention, the novel features of the present invention are identified below with reference numerals. However, the use of reference numerals should not be construed as limiting the claimed elements to the exemplary embodiment illustrated in the drawing figures.

Independent Claim 1 requires:

(i) a guide member (120) fixed to the base (110), and a piston pressing member (130) held by the driving mechanism (140) that is provided on the base (110); the guide member (120), the piston pressing member (130), and the driving mechanism (140) being provided on the base (110);

(ii) the piston pressing member (130) has a centering part for performing a centering action while coming into contact with an upper end edge (Pe) of the piston suspended downwardly in the vertical direction; and

(iii) the centering part of the piston pressing member is formed into a cylindrical cap-shaped member that is opened downwardly and has a notch part (132) defined by cutting off a part thereof so as not to come into contact with the connecting rod, and a tapered inner wall surface (131) widened downwardly so as to come into contact with the upper end edge of the piston.

The present invention, as defined in claim 1, includes the above-mentioned features (i), (ii), and (iii), and the following advantageous effects and/or unexpected results (a-d) can be obtained.

(a) Since the driving mechanism, the piston pressing member, and the guide member are provided on the base and the piston pressing member performs a centering action, the piston and the piston ring can be highly accurately and easily positioned in the horizontal and vertical directions with a simple structure, thereby improving productivity, and reducing production costs;

(b) Since the tapered inner wall surface, which functions as a centering part of the piston pressing member, performs a centering action while coming into contact with the upper end edge of the piston, a positioning operation in the horizontal direction can be easily performed;

(c) Since the inner wall surface of the piston pressing member is used as a centering part, the structure can be simplified; and

(d) Since the piston pressing member has a notch part, formed so as not to come into contact with the connecting rod, horizontal positioning can be performed in a highly accurate manner while maintaining a horizontal state without inclining the piston.

Discussion of the Prior Art References

Liechty discloses, as shown in Figs. 1-4, a piston ring apparatus including;

a base (fixed support structure 20);

a guide member (piston nest member 10) that is fixed to the base (20), positions a piston in a vertical direction while receiving a head of the piston suspended downwardly in the vertical direction, guides a piston ring while widening a diameter of the piston ring by means of an outer peripheral surface (upwardly diverging conical periphery 12d), and has a convex part (anti-drop vane 12f) for restricting downward movement of the piston ring;

a piston pressing member (slide 6, and fixture members 4) provided on a conveyor (piston carousel 8) so as to be disposed above the base (20) and capable of moving so as to press the piston into a concave part (cup-shaped recess 22) of the guide member (10) while holding the piston downwardly in the vertical direction;

a driving mechanism provided on the conveyor (S) so as to drive the piston pressing member (6, 4) in the vertical direction;

a ring feeding mechanism (fingers 80, 82 and arms 90, 92) for feeding the piston ring fed to the guide member upwardly;

a ring sensor (first and second fiber optic members 140, 142); and

a support plate (144) provided on a frame and supporting the ring sensor (140, 142).

In the Liechty apparatus, as shown in Fig. 1, the member (144) is a support plate (144) provided on a frame for supporting the sensor. However, in Liechty, the piston pressing member (6, 4) and the driving mechanism for driving the piston pressing member are provided on the conveyor (8), i.e. not on the support plate. Thus, Liechty does not disclose an arrangement in which the guide member, driving mechanism, and piston pressing member are provided on the base (20) as required in amended claim 1.

Also, Liechty does not disclose or suggest that the piston pressing member (6, 4) has a centering part for performing a centering action while coming into contact with an upper end edge of the piston suspended downwardly in the vertical direction, and that a centering part of the piston pressing member is formed into the shape of a cylindrical cap that is opened downwardly. Note that claim 1 also specifies that the centering part of the piston pressing member has a notch part defined by cutting off a part thereof so as to not come into contact with the connecting rod, and a tapered inner wall surface that is widened downwardly so as to come into contact with the upper end edge of the piston. Thus, claim 1 is clearly allowable over the Liechty apparatus.

Davis teaches, as shown in Figs. 1 and 9, a loading sleeve for installing a piston with piston rings into a cylinder bore. The sleeve (20, 70) has a lower end portion (bore end 26, 77) capable of connecting with a cylinder bore of an engine, and a tapering surface (30) that is tapered downwardly. However, Davis does not disclose or suggest that a piston pressing member and a driving mechanism, for driving the piston pressing member, are provided on a base as required by amended claim 1.

Also, Davis does not teach or suggest a piston pressing member having a centering part for performing a centering action while coming into contact with an upper end edge of the piston suspended downwardly in the vertical direction, or a centering part of the piston pressing member formed in the shape of a cylindrical cap that is opened downwardly and has a notch part

defined by cutting off a part thereof so as not to come into contact with a connecting rod, and a tapered inner wall surface widened downwardly so as to come into contact with the upper end edge of the piston.

Therefore, it is submitted that the collective teachings of the Liechty and Davis references do not disclose or suggest each and every limitation of independent claim 1. In particular, the following features are clearly not taught by the Liechty and Davis references:

(i) the guide member, the piston pressing member, and the driving mechanism are provided on the base;

(ii) the piston pressing member has a centering part for performing a centering action while coming into contact with an upper end edge of the piston suspended downwardly in the vertical direction; and

(iii) the centering part of the piston pressing member is formed into the shape of a cylindrical cap that is opened downwardly and has a notch part defined by cutting off a part thereof so as not to come into contact with the connecting rod, and a tapered inner wall surface widened downwardly so as to come into contact with the upper end edge of the piston.

Accordingly, it is submitted that the present invention, as defined in amended claim 1, is now clearly allowable over the prior art of record. Further, claims 4-7 depend from claim 1 and are therefore allowable at least by virtue of their dependencies.

In the event that the Examiner has any comments or suggestions of a nature necessary to place this case in condition for allowance, then the Examiner is requested to contact Applicant's undersigned attorney by telephone to promptly resolve any remaining matters.

Respectfully submitted,

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